



## 2011 Wadeable Stream Aquatic Community Resource Brief

### Whiskeytown National Recreation Area

#### Why monitor streams?

Water quality and aquatic communities were identified as high-priority vital signs. Streams are a dominant feature of the landscape, both aesthetically and functionally in the parks. Their position in the watershed, integrating upstream watershed disturbances, both naturally occurring and man-made, makes them powerful vital signs for monitoring park conditions. See the full, [final protocol](#) for additional details.

#### Aquatic Community parameters of concern

This resource brief focuses on four biological indices that are monitored by the Klamath Inventory and Monitoring Network. They are: (1) EPA Invertebrate Multi-Metric Index (MMI), (2) EPA Aquatic Vertebrate MMI, (3) Observed/Expected ratio of taxa loss, and (4) regional MMI indices (in this case, eastern Sierra Nevada IBI [Herbst and Silldorff 2009]). The first three indices comprise the indicators of biological condition used by the Environmental Protection Agency's [Wadeable Streams Assessment](#), and the final one uses the California Regional Water Quality Control Board index. All four of these indices take complex ecological information collected from our field sampling of 100+ invertebrate and vertebrate species and distill it down to a single variable for natural resource condition assessments.



*Why invertebrates?* Stream invertebrates are a diverse group of organisms encompassing many life history traits, food sources, habitat requirements, reproduce quickly and with limited dispersal, and act as a vital pathway for energy flow from stream primary producers to top vertebrate consumers in aquatic environments (fish, amphibians) and terrestrial environments (birds, bats, spiders). These traits, along with varied but predictable responses to anthropogenic disturbance make them ideal biomonitoring organisms. We also use a single vertebrate index, but a natural low diversity in mountain streams reduces the utility of fish and amphibians as sole indicators of aquatic health.



*What are multi-metrics indices?* Originally used in Midwestern streams with fish assemblages, these indices combine information from multiple aspects of community data: composition, diversity, feeding specializations, habits, tolerance to pollution, and overall richness of the stream. By combining these individual metrics, an overall comprehensive robust index of ecological health, much the same way the Dow Jones Industrial index combines many individual metrics into a single, trackable number reflecting economic health. Each metric is independently developed using larger regional datasets calibrated to different disturbances. Hence, different MMIs may score and inform managers differently.



*What are O/E scores?* The Observed/Expected Ratio of Taxa Loss is a measure of ecological health using the number of macroinvertebrate taxa not present at a site based on expected conditions using regional, non-impacted reference sites. Using a large sample set of these reference sites, a predicted/expected value of taxa under no impairment can be modeled. The number actually observed is then compared using a ratio of the Observed/Expected. Values range from 0 (no expected taxa present) to just over 1 (more taxa present than expected). Interpretation is based on each tenth of a point less than 1 equating to a 10% loss of taxa at a site. Hence, a score of 0.80 equals a 20% loss in expected biodiversity.

#### Results

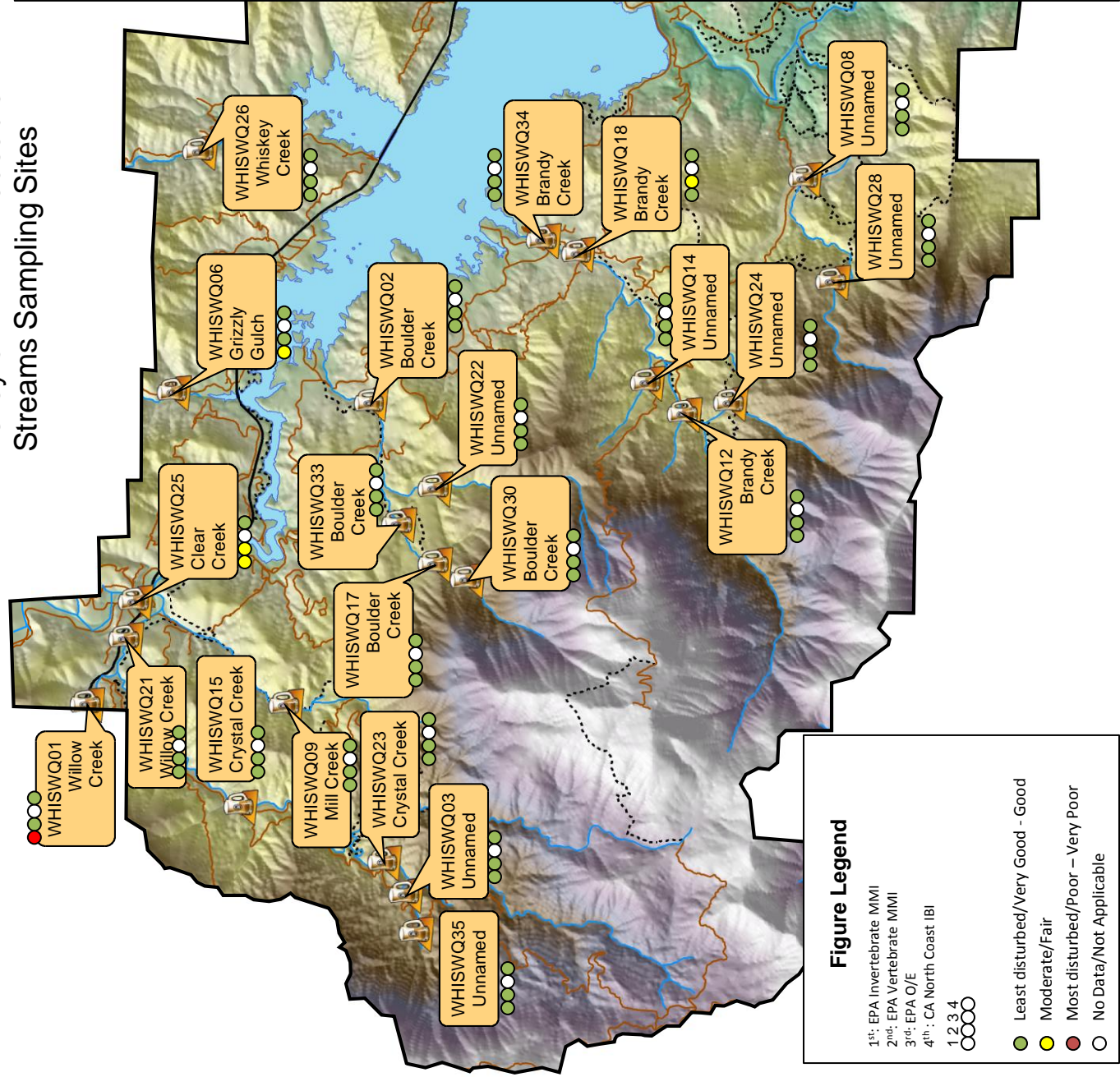
Twenty-two sites were sampled in the summer of 2011, the first field season for Whiskeytown NRA wadeable streams (see map/results on back). Future years (2014, 2017, etc.) will resample these same sites (plus additional ones if time/funding allows) for current status and eventual trend detection.

In general, biological indicators suggest above average to excellent water quality compared to national sites. The EPA MMIs give comparable results, with general agreement that not water quality impairment exists. One site, Willow Creek, did exhibit a degraded status using the EPA MMI for invertebrates, and was also one of the lowest scoring sites using the CA North Coast IBI. Attention should be given to this site and potential stressor identified. Note that the North Coast IBI covers several regions, including the Whiskeytown area. Overall interpretation of these results must be in the context of the original metric and how the metric was created, and for final interpretation, please consult the forthcoming annual report.

	EPA West-Wide Invertebrate MMI	EPA West-Wide Vertebrate MMI	EPA West-Wide O/E <sup>1</sup>	CA North Coast IBI	
Sample size	22	22	N/A	22	
Average (SE)	78 (±1.8)	76.8 (±2.7)	N/A	76 (±1.4)	
Median	78	73.6	N/A	77	
Range	53 - 96	57.9 - 100	N/A	63 - 86	
# Least Disturbed	19	20	N/A	10	# Very Good
# Moderate	2	2	N/A	12	# Good
# Most Disturbed	1	0	N/A	0	# Fair

<sup>1</sup>Awaiting necessary files from EPA for these calculations

Whiskeytown NRA Wadeable  
Streams Sampling Sites



Actual Values		Metric			
Site Code		EPA Invert. MMI	EPA Vert. MMI	EPA O/E	CA North Coast IBI
Stream Name	WHISWQXX				
Willow Creek	01	53	89		64
Boulder Creek	02	90	100		84
Unnamed	03	78	67		80
Grizzly Gulch	06	66	72		71
Unnamed	08	96	87		85
Mill Creek	09	76	63		85
Brandy Creek	12	85	75		85
Unnamed	14	79	100		73
Crystal Creek	15	79	79		81
Boulder Creek	17	92	87		80
Brandy Creek	18	84	58		68
Willow Creek	21	73	72		75
Unnamed	22	78	68		80
Crystal Creek	23	79	68		81
Unnamed	24	77	66		74
Clear Creek	25	67	59		71
Whiskey Creek	26	77	75		69
Unnamed	28	76	79		73
Boulder Creek	30	75	100		79
Boulder Creek	33	82	68		70
Brandy Creek	34	70	71		63
Unnamed	35	80	85		86

All metrics range from 0 – 100. However, condition is assigned on different threshold values based on reference , non impacted sites.

Condition Thresholds\*

EPA		CA North Coast IBI	
Invert. MMI	Vert. MMI	O/E	
Least Disturbed	≥ 71	≥ 62	≥ 80
Most Disturbed	<57	< 37	< 50

\*Sources: [Rehn et al. 2005](#), [Stoddard et al. 2005](#), [EPA 2006](#).